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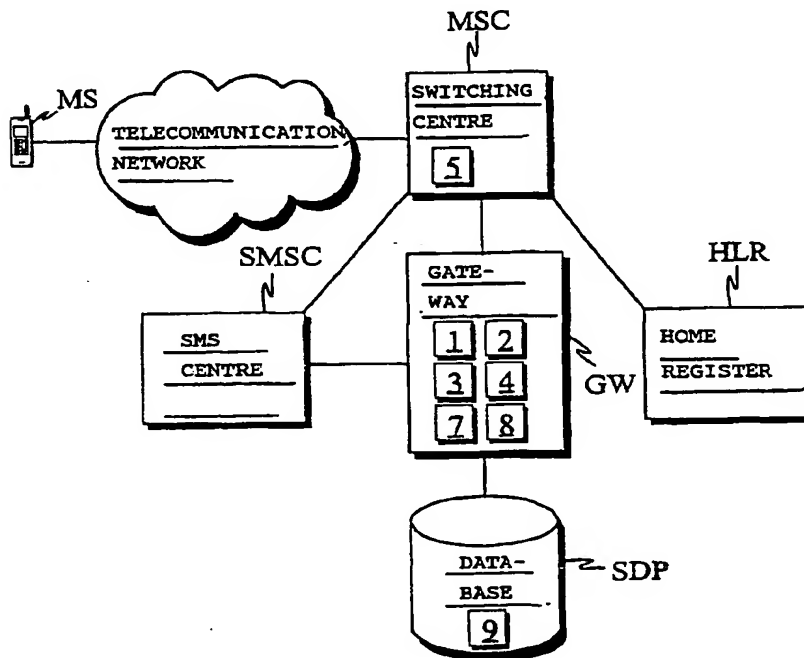
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[Continued on next page]

(54) Title: HANDLING OF SHORT MESSAGES IN A TELECOMMUNICATION SYSTEM



(57) Abstract: The invention relates to a method and system of charging short messages in a mobile communication system comprising a mobile switching centre (MSC) in which the short message is transmitted; a terminal device (MS) by means of which the subscriber has been connected to the mobile communication system and by means of which a short message is created; a short message switching centre (SMSC) which has been connected to said mobile switching centre (MSC); and a gateway (GW) which has been connected to said mobile switching centre (MSC) as well as a service data point (SDP) which comprises the subscriber's balance and which has been connected to said gateway (GW). In the method, the short message is directed from the terminal device (MS) via the mobile communication system to said gateway (GW), wherein based on the B number the payment class of the short message and the

subscriber are identified, and a subscriber-specific checking of balance and an update to service data point are effected. If the subscriber has got enough balance available for use, the balance is updated as concerns the short message in response, and it is transmitted via the short message switching centre (SMSC) to the receiver. If there is not enough balance left, or the subscriber is not entitled to a prepaid service, a notification is sent from the gateway (GW) to the terminal device (MS).

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# HANDLING OF SHORT MESSAGES IN A TELECOMMUNICATION SYSTEM

## FIELD OF THE INVENTION

5           The present invention relates to telecommunication systems. In particular, the present invention relates to a method of charging short messages in a mobile communication system comprising a mobile switching centre, terminal device by means of which  
10 the subscriber is connected to the mobile communication system and by means of which a short message is created, a short message switching centre which has been connected to said mobile switching centre, and a gateway which has been connected to said mobile  
15 switching centre as well as a service data point which comprises the subscriber's balance and which has been connected to said gateway. In the method, a short message created by the terminal device is directed from the mobile communication system to said gateway.

20

## BACKGROUND OF THE INVENTION

          Mobile communication networks such as, e.g. GSM networks (GSM, Global System for Mobile communications) have become very popular in a big part of the  
25 world. In this application, a mobile communication network is advantageously used to mean a digital mobile communication network. Since the introduction of the digital mobile networks, a short message service (SMS, Short Message Service) has been a part of the  
30 services provided. The short message service function allows the mobile subscriber to send text messages that contain up to 160 characters from his or her terminal device to, e.g. another subscriber who has got a  
35 terminal device capable of receiving short messages at his or her disposal.

Nowadays, both the fixed telephone networks and the mobile networks provide a wide range of services relating to the possibilities offered by the operators of a wired or wireless network. The services  
5 provided may comprise a fixed or a remotely controlled call transfer, call waiting, calling number display blocking, advance notices of billing for subscribers, and different informative message services. The intelligent network system enables a more efficient allocation and control of services. A prepaid call is one  
10 good example of a benefit brought by the intelligent network to the customer. For the operators it has enabled a more advanced way of arranging the debiting.

Previously known is a system in which a prepaid service, e.g. a prepaid call has been implemented  
15 either by means of the intelligent network or a separate service point. As concerns short messages, a corresponding service has been implemented in accordance with the prior-art technique, and maintained by operating separate SIM cards.  
20

In that case, the problem has been a scattered target group, difficult to reach the management of which has been troublesome. A problem associated with this solution has also been the information security, control of malpractice, and maintenance. In this  
25 context, information security means a more efficient protection of subscriber-specific information, such as personal data, restrictions of use, balances, and billing traffic. When all the important subscriber-specific information is under the control of the operator in a well-protected database, the level of information security may be made significantly better, and the amount of malpractice may be made less.  
30

The updating of information has also become a  
35 problem, i.e. in practice this means the updating of the user data of the SIM cards. Especially, the meaning of real-time operation has become highly topical

as concerns the services and update operations provided by the operators. This is emphasized especially in the real-time updating of balance data of a subscriber. In that case, the billing will become more  
5 clear and effective, and the operator is able to increase the efficiency of his or her operations. The aforementioned real-time updating of information, especially the weak control of billing and allocation has been a significant problem for the solving of  
10 which a new method and system has been developed.

The objective of the invention is to eliminate or at least significantly alleviate the problems mentioned above. One specific objective of the invention is to disclose a new kind of method and system  
15 that make it possible to charge short messages based on the criteria for a prepaid call. The new method and system give the operator the possibility for a real-time updating of user-specific information, and a general maintenance, a better control of the user restrictions of short messages, and a more efficient information security.  
20

#### BRIEF DESCRIPTION OF THE INVENTION

25 The present invention is used for the implementation of a prepaid short message service as a functionality of the network in such a way that for each separate subscriber, a balance of short messages he or she is entitled to is stored on the service data  
30 point. After each short message sent, the subscriber-specific balance is automatically updated. If there is no balance left, the subscriber is sent an error message, and also in that case if the subscriber is not entitled to the service in question.

35 The invention concerns a method of arranging a prepaid service for short messages in a mobile communication system comprising a gateway which has been

connected to the mobile communication system. The mobile communication system comprises a mobile switching centre, and a short message switching centre as well as a terminal device which has been connected to the mobile communication system. The service data point has been connected to the gateway. In the invention, the new functionality relating to the charging for a short message is implemented by the gateway. The gateway contains such progressive features that the standard components of a mobile communication network do not include. As concerns the functionality, essential is the fact that the gateway enables signaling between different network components without the actual network components having the ability to communicate with each other.

In the method, not every short message created by the terminal device is directed from the mobile communication system to the gateway. There are directed only those which the network has recognized as belonging there. When the subscriber is entitled to the aforementioned service, in response to said short message, the balance of the subscriber is checked from the service data point, and the short message is transmitted to the address selected by the subscriber, if there is enough balance left.

In an embodiment of the invention, the short message is routed from the terminal device to the gateway according to an ick analysis of the mobile communication system. Ick analysis (Ick, Intelligent category keying) means a subscriber-specific identification analysis for calls and short messages. The identification data of the ick analysis has been stored on a home location register, e.g. on connection of the terminal device to the network. The identification data is transferred to the visitor location register, which is, e.g. in conjunction with the mobile switching centre.

In an embodiment, the terminal device is sent a notification via the gateway, if the short message was not sent. The notification may be, e.g. a SMS type of error message or an acknowledgement message or some other corresponding message to be sent via the network through which the user is informed, e.g. of the running out of balance or of a function contradictory to the user restrictions.

In an embodiment of the invention, the subscriber-specific checking of balance is effected from the service data point, from a data record corresponding to the A number of the short message, and the balance is updated on the service data point in response to the short message transmitted to the receiver.

In addition, the invention concerns a system of arranging charging for short messages in a telecommunication system which comprises a mobile communication system in which the short message is transmitted, a terminal device by means of which a mobile subscriber has been connected to the mobile communication system and by means of which the short message is created. In addition, the system comprises a short message switching centre which has been connected to the mobile communication network, and a gateway which has been connected to the mobile communication network.

In accordance with the invention, the billing system comprises a service data point on which the subscriber's balance has been stored and which is connected to the gateway. The system comprises, in addition, an identifier by means of which it is verified whether the subscriber is a subscriber of a prepaid service; a checker by means of which the balance of said subscriber of a short message is checked from the service data point in response; and a transmission component by means of which said short message is transmitted to the address selected by the subscriber, if there is enough balance left.

In an embodiment, the system comprises a data recorder for updating the balance on the service data point in response to the short message transmitted to the receiver as well as a central program by means of which data records are maintained relating to the subscriber balances and prices of short messages.

In an embodiment, said gateway comprises an acknowledgement device for sending a message to the terminal device, if the short message was not sent. In that case, the subscriber is promptly informed of the transmission failure and may act as instructed by the message.

In an embodiment, the mobile communication system in accordance with the invention comprises a control component for directing the short message to the gateway based on the ick analysis. The ick analysis is described in greater detail in the standards, and is therefore not described herein in greater detail.

In an embodiment of the invention, the gateway comprises a payment class identifier for determining the payment class of a short message based on the A and B numbers.

In addition, the gateway may comprise a data recorder for updating the balance on the service data point in response to the short message transmitted to the receiver as well as a central program by means of which data records are maintained relating to the subscriber balances and prices of short messages.

#### BRIEF DESCRIPTION OF THE DRAWINGS

In the following section, the invention will be described by way of examples of its embodiments with reference to the attached drawing, in which

fig.1 is a schematic representation of one embodiment of the system of the invention,



fig. 2 represents one advantageous signaling diagram describing the function of the present invention, and

fig. 3 is a flow chart illustrating one method of the invention.

#### DETAILED DESCRIPTION OF THE INVENTION

As the starting point in attaching short messages to a prepaid service has served a new way of utilizing the components of the intelligent network. A normal prepaid call is directed from the terminal device via the service switching point ( SSP ) of the intelligent network service to the service control point ( SCP ) of the intelligent network service, from which in accordance with the service logic, a query is made to the service data point ( SDP ). After this, if the subscriber is entitled to the call, the call is normally transmitted further on. In the case of a short message, the message that was sent is directed from the terminal device to the short message switching centre (SMSC) from which it is directed further on to the gateway (GW) in the form of a MS-ISDN number (Mobile Station ISDN Number). The gateway performs the balance checking and the update on the service data point (SDP). If the subscriber is entitled to the short message, the message is transmitted further on in a normal way.

The system as illustrated in figure 1 comprises a terminal device MS and a centre MSC. In this example, the centre is a mobile switching centre (MSC). The terminal device is advantageously a mobile subscriber (MS). The mobile subscriber MS has been connected to the mobile switching centre MSC via a radio interface. The system also comprises a gateway (GW), a home location register (HLR), a short message switching centre (SMSC), and a service data point (SDP).

Both the gateway GW and the home location register HLR have been connected to the mobile switching centre MSC. In addition, the gateway GW has been connected to the short message switching centre and the service data point SDP.

Further, the system as illustrated in figure 1 comprises an identifier 1 by means of which it is verified whether the subscriber is a subscriber of a prepaid service; a checker 2 by means of which the balance of the subscriber of said short message is checked from the service data point SDP in response; and a transmission component 3 by means of which said short message is transmitted to the address selected by the subscriber, if there is enough balance left. The gateway GW also comprises an acknowledgement device 4 for sending a message to the mobile subscriber MS, if the short message was not sent.

In addition, the mobile communication system as illustrated in figure 1 comprises a control component for directing the short message to the gateway GW based on the tick analysis. The gateway GW further comprises a payment class identifier 7 for determining the payment class of a short message based on the B number. Further, the system comprises a data recorder 8 for updating the balance on the service data point in response to the short message transmitted to the receiver as well as a central program 9 by means of which data records are maintained relating to the subscriber balances and prices of short messages.

The identifier 1 of the gateway GW receives the short message and based on the B number identifies the payment class of the short message and whether it is a question about a subscriber of a prepaid service. The identifier reads the payment class in accordance with predetermined characters and transmits an acceptance or non-acceptance message concerning the subscriber's right to the prepaid service. The checker 2

checks the balance of the subscriber concerned by means of a database query, e.g. a SQL, structured query language, from the service data point SDP. By means of the data recorder 8 the balance is updated on  
5 the service data point SDP in response to the short message transmitted to the receiver.

The gateway GW may comprise, e.g. the following components and functions:

- the service data points required, which in this  
10 context include, e.g. the subscriber-specific balance data.
- computer components
- signaling components, (SS7, Signaling System number 7)
- 15 - the software required (for instance, the service creation, performing and management environment, description of services)
- signaling protocols (INAP, MAP, TCAP, TCP/IP; INAP, Intelligent Network Application Part; MAP, Mo-  
20 bile Application Part; TCAP, Transaction Capabilities Application part; TCP/IP, Transmission Control Protocol, Internet Protocol)

The service data point SDP comprises a central program 9 for maintaining data records relating  
25 to the subscriber balances and prices of short messages. By means of the central program 9 the maintainer of the databases is able to react to the update requests made by the data recorder 8 of the gateway GW that are deletion and saving operations to the record  
30 fields.

Let it be mentioned, in addition, that the control component itself is a normal element of a mobile switching centre.

Fig. 2 is one advantageous signaling example  
35 representing the function of the system in accordance with the invention. As illustrated in figure 2, the short message comes to the mobile switching centre

MSC, arrow 21. From the mobile switching centre MSC, a location query, SendRoutingInfo message is sent to the home location register HLR, in which case the location area of the mobile subscriber is identified, arrow 22.

5 Step 23 describes an ick analysis (Ick, Intelligent category keying) by means of which a subscriber-specific identifier is generated for calls and short messages. The home location register HLR returns the routing information to the mobile switching centre,

10 arrow 24. The short message is sent in the form MS-ISDN to the gateway GW, arrow 25, after which database queries are made from the gateway to the service data point SDP, arrow 26. In the query, the subscriber's balance is checked and updated. The queries are made

15 using a known database query language, advantageously, e.g. a SQL, structured query language). SQL is a general standard and a programming language which enables one to make different queries, e.g. to databases. If there is enough balance, the short message is sent

20 further on, step 27. If there is not enough balance, a notification thereof is sent to the terminal device of the subscriber via the mobile switching centre MSC and the short message switching centre SMSC, arrow 28. If there is enough balance, the short message is trans-

25 mitted further on to the short message switching centre and from it based on the routing information to the receiver.

Fig. 3 is a flow chart illustrating one example of the method of the invention. At a step 30, a short message is created on the terminal device MS,

30 and at a step 31 this message is sent from the terminal device to the mobile switching centre MSC. At a step 32, an ick analysis of the network is performed, and at a step 33 it is verified whether it is a question about a subscriber of a prepaid service. If it is

35 a question about an ordinary short message, then it is transmitted further on normally, step 34. Step 35 de-

scribes the end of the process, when the receiver has received the message that was sent. If it is a question about a short message of a subscriber of a pre-paid service, it is routed to the gateway GW, step 36, and at a step 37 a database query according to the service logic is made from the gateway relating to the subscriber's balance and the payment class of the short message. At a step 38, the subscriber's balance is checked and at a step 39 the subscriber is sent a notification, if there is no balance left. At a step 40, the short message is transmitted further on via the short message switching centre SMSC to the receiver, and at a step 41 the subscriber's balance is updated according to the fact of what price the short messages transmitted have been.

The invention is not restricted to the examples of its embodiments, instead various changes are possible within the scope of the inventive idea defined by the claims.

## CLAIMS

1. A method of charging short messages in a mobile communication system comprising:

a mobile switching centre (MSC);

5 a terminal device (MS) by means of which the subscriber has been connected to the mobile communication system and by means of which a short message is created;

a short message switching centre (SMSC) which has been connected to said mobile switching centre (MSC);

10 a gateway (GW) which has been connected to said mobile switching centre (MSC);

a service data point (SDP) which comprises the subscriber's balance and which has been connected to said gateway (GW);

15 which method comprises the steps:

the short message created by the terminal device (MS) is directed from the mobile communication system to said gateway (GW), characterised in that the method further comprises the following steps:

20 it is verified whether the subscriber is a subscriber of a prepaid service, and in case yes:

in response to said short message the subscriber's balance is checked from the service data point (SDP);

25 and

the short message is transmitted to the address selected by the subscriber, if there is enough balance left.

30 2. A method as defined in claim 1, characterised in that a notification is sent from the gateway (GW) to said terminal device (MS), if the short message was not sent.

3. A method as defined in claim 1 or 2, characterised in that said short message is directed to said gateway (GW) based on the analysis of the mobile communication system.

35

4. A method as defined in claim 1, 2, or 3, characterised in that on said gateway (GW) the payment class of the short message is selected based on the B number.

5           5. A method as defined in claim 1, 2, 3, or 4, characterised in that the subscriber-specific balance is checked from said service data point (SDP) based on the A number of the short message.

10           6. A method as defined in claim 1, 2, 3, 4, or 5, characterised in that in response to the short message transmitted to the receiver, the balance is updated on the service data point (SDP).

15           7. A system of arranging billing for short messages in a mobile communication system comprising:

          a mobile switching centre (MSC);

          a terminal device (MS) by means of which the subscriber has been connected to the mobile communication system and by means of which a short message is created;

20           a short message switching centre (SMSC) which has been connected to said mobile switching centre (MSC);

          a gateway (GW) which has been connected to said mobile switching centre (MSC); and

25           a service data point (SDP) which comprises the subscriber's balance and which has been connected to said gateway (GW); characterised in that the system comprises:

30           an identifier (1) by means of which it is verified whether it is a question about a subscriber of a pre-paid service;

          a checker (2) for checking, in response, the balance of the subscriber of said short message from the service data point (SDP); and

35           a transmission component (3) for transmitting said short message to an address selected by the subscriber, if there is enough balance left.

8. A method as defined in claim 7, characterised in that said gateway (GW) comprises an acknowledgement device (4) for sending a notification to the mobile subscriber (MS), if the short message was not sent.

9. A method as defined in claim 7 or 8, characterised in that the mobile communication system comprises a control component (5) for directing the short message to the gateway (GW) based on the ick analysis.

10. A method as defined in claim 7, 8, or 9, characterised in that said gateway (GW) comprises a payment class identifier (7) for determining the payment class of a short message based on the B number.

11. A method as defined in claim 7, 8, 9, or 10, characterised in that the system further comprises a data recorder (8) for updating the balance on the service data point in response to the short message transmitted to the receiver as well as a central program 9 by means of which data records are maintained relating to the subscriber balances and prices of short messages.



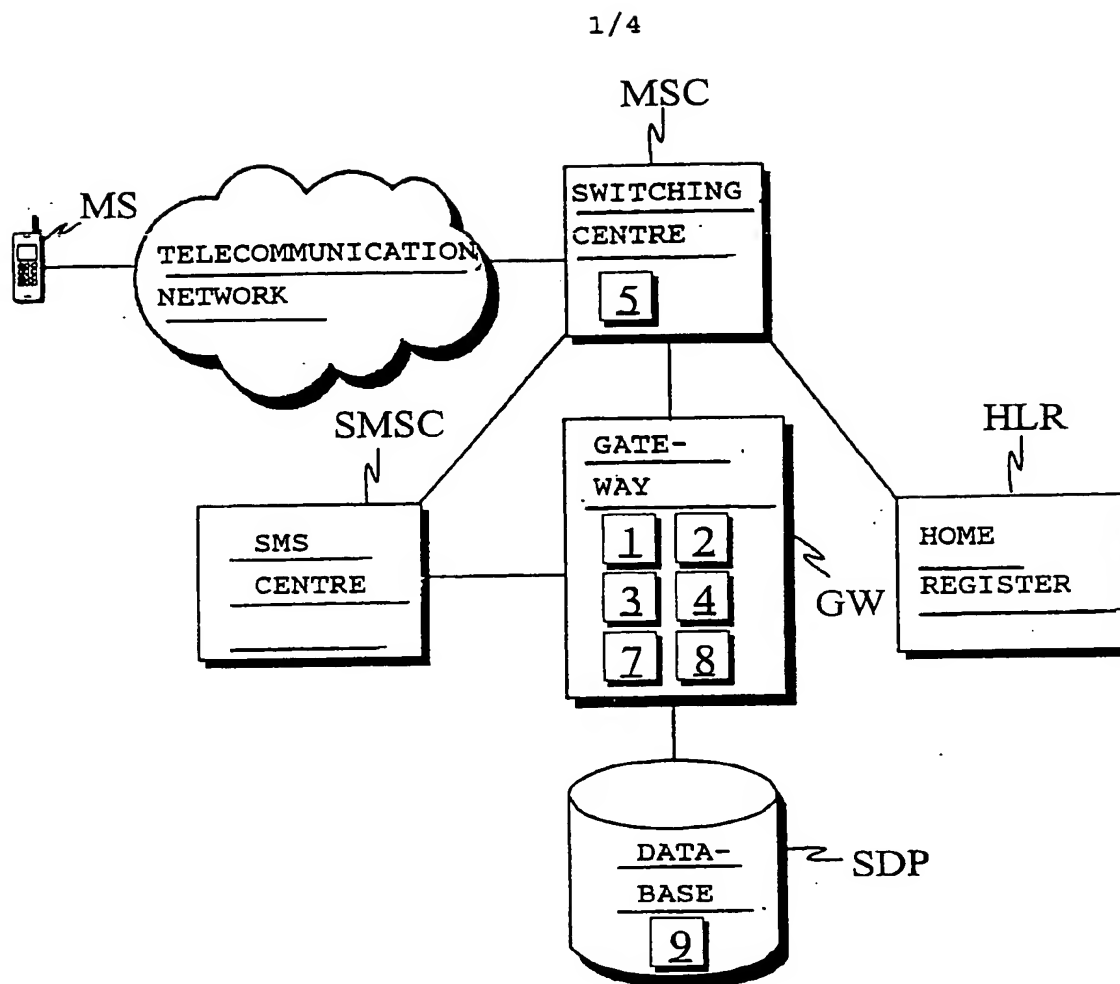


Fig. 1

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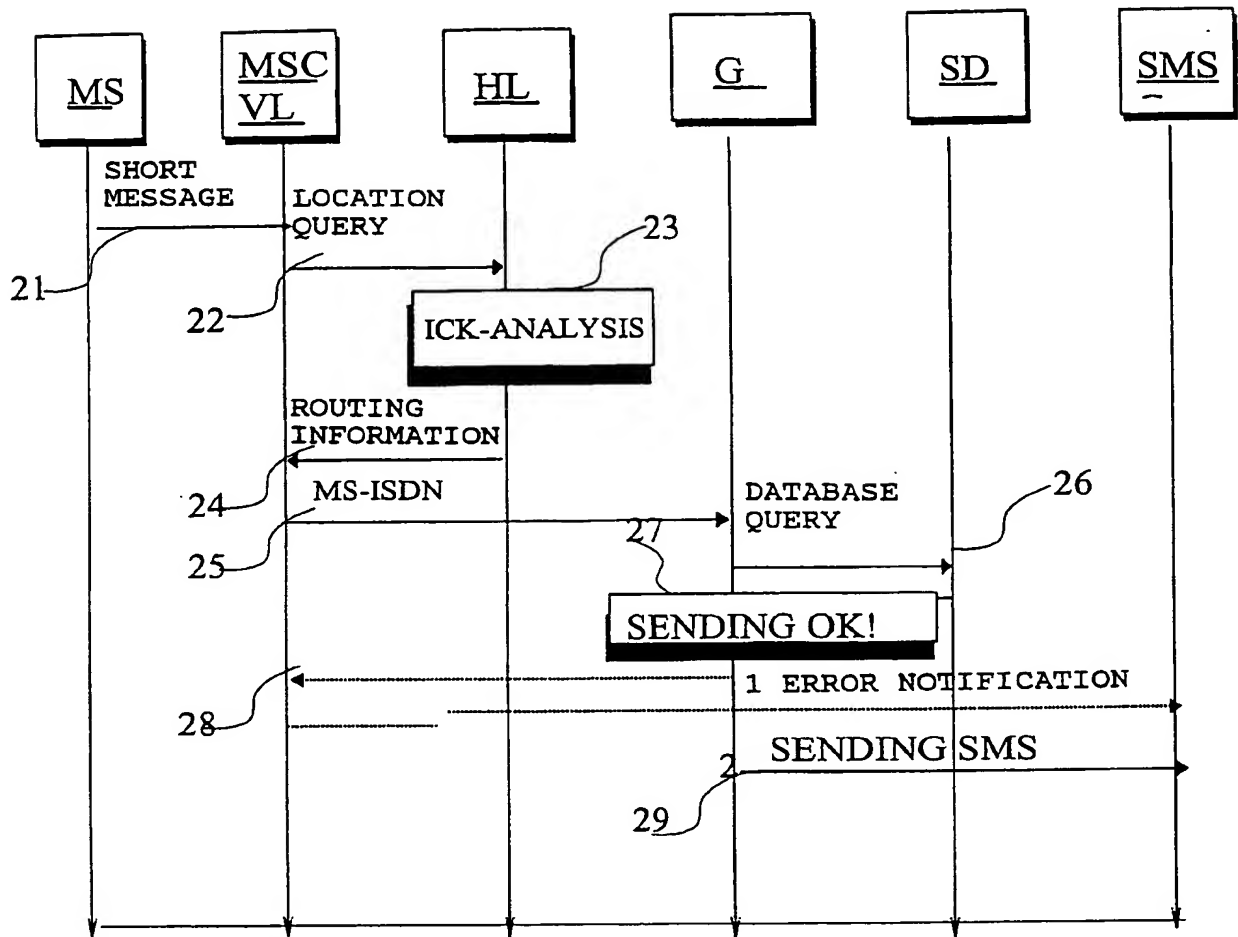


Fig.

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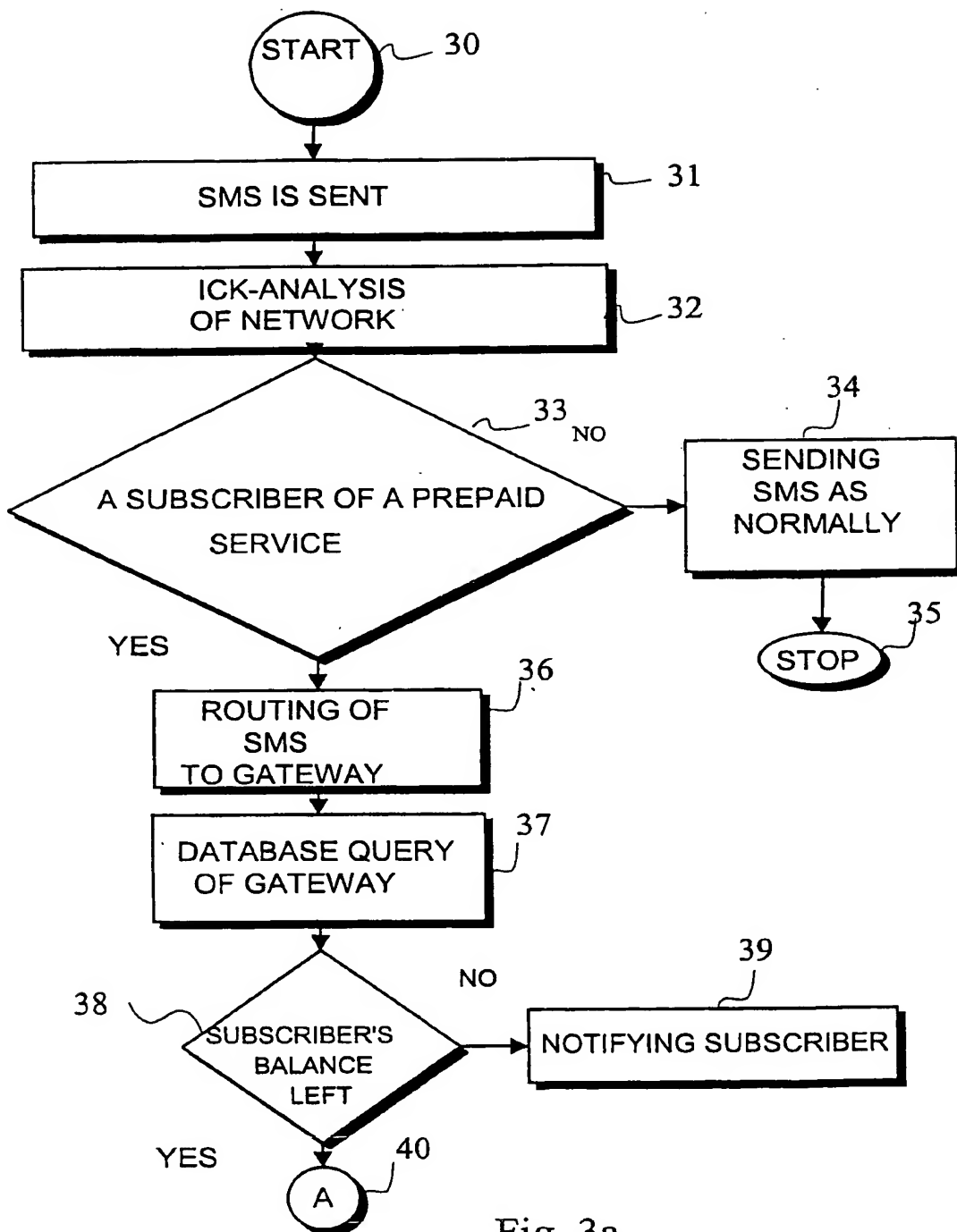


Fig. 3a

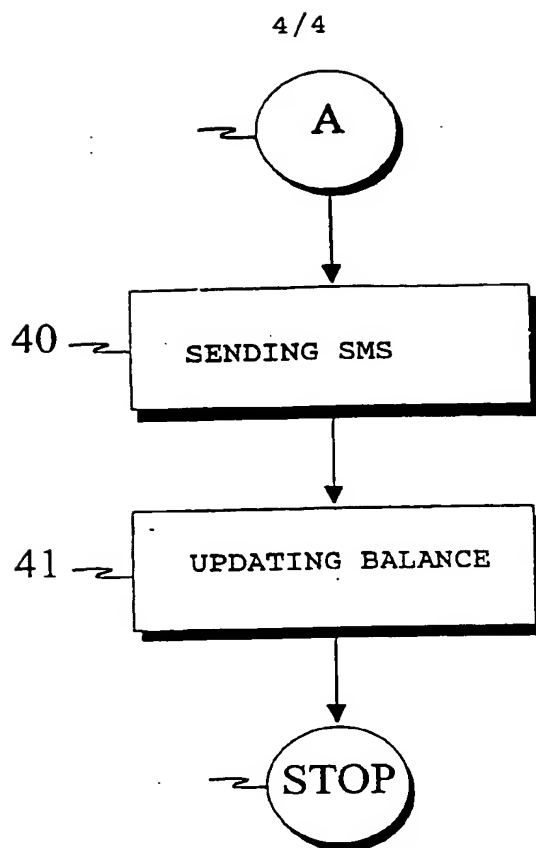


Fig. 3b

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00787

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38, H04M 17/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q, H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|-----------|---|-----------------------|
| Y         | WO 9856202 A2 (NOKIA TELECOMMUNICATIONS OY),<br>10 December 1998 (10.12.98), page 2,<br>line 18 - page 3, line 30<br>--                   | 1-11                  |
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Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

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Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

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International application No.

PCT/FI 00/00787

| Patent document<br>cited in search report |         |    |          | Publication<br>date |         | Patent family<br>member(s) | Publication<br>date |
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